

10/666,982

- 4 -

**REMARKS**

Claims 1-5, 24 and 25 are pending in the application. In the Office Action at hand, those claims are rejected.

Claims 1-5 are rejected under 35 U.S.C. Section 103(a) as being unpatentable over Namba (U.S. 5,244,552) in view of Helfritsch (U.S. 5,695,616). In addition, Claims 24 and 25 are rejected under Section 103(a) as being unpatentable over Namba and Helfritsch in view of Hirai (U.S. 5,015,442). In response to the Section 103(a) rejections, the Applicant respectfully submits that Claims 1-5, 24 and 25, as amended, are not obvious in view of Namba, Helfritsch, and Hirai. Reconsideration is respectfully requested.

Claim 1, as amended, recites a gas conversion system for removing NO<sub>x</sub> and SO<sub>x</sub> from gases and includes a duct having a rectangular cross section having a width and height through which the gases flow. The duct can have a port for introducing a reaction agent into the duct to the gases. First and second electron beam emitters each having a single exit window can be mounted to the duct over openings in the duct opposite from each other for directing opposed electron beams into the duct and causing components of the NO<sub>x</sub>, SO<sub>x</sub> and reaction agent to react to remove NO<sub>x</sub> and SO<sub>x</sub> from the gases. The duct can be shaped and sized, and the electron beam emitters can be configured, shaped and sized to generate electron beams that provide complete continuous electron beam coverage across the width and height of the cross section of the duct with generally evenly dispersed electrons. Claim 3, as amended, recites a treatment system, and Claim 4, as amended, recites an electron beam treatment system.

Claims 1, 3 and 4 have been amended to recite "a duct having a rectangular cross section having a width and height," and "the electron beam emitters being configured, shaped and sized to generate electron beams that provide complete continuous electron beam coverage across the width and height of the cross section of the duct with generally evenly dispersed electrons." Support for these amendments is found at least in FIGs. 3-5, as well as on page 7, line 3, page 9, lines 10-25 and page 11, lines 12-23 of the Specification as originally filed.

In embodiments of the claimed invention, the electron beam emitters can be configured, shaped and sized to provide electron beams having generally evenly dispersed electrons with a shape to provide complete, continuous electron beam coverage across the width and height of the

10/666,982

- 5 -

cross section of an appropriately shaped and sized rectangular duct, for example, as seen in FIGs. 3 and 4. In some embodiments, generally straight electron beams with generally evenly dispersed electrons, can be generated and can have a generally straight or non spreading configuration when entering the duct. Opposed generally straight electron beams can be relatively easily combined to provide complete, continuous and even electron beam coverage with evenly dispersed electrons across the width and height of the cross section of a rectangular duct. As a result, a gas, compound or substance flowing through the duct can be generally evenly and continuously treated with electrons at any particular width or height location within the cross section of the duct, thereby resulting in consistent and thorough treatment.

Namba discloses in FIG. 1 an irradiation chamber 2 irradiated by three electron beam generators 1 positioned in spaced apart fashion over or above the irradiation chamber 2 sequentially in the direction of flow. As a result, the gas passes through both irradiation zones 3 and non irradiation zones 4. Column 3 teaches that ozone is generated by the electron beams. FIG. 2 discloses that a series of electron beam generators can be positioned under or below the irradiation chamber 2 to provide opposed electron beams within the irradiation chamber 2. Namba does not disclose the cross sectional shape of the irradiation chamber 2, since FIGs. 1 and 2 only show side views. Therefore, Namba does not teach a duct with a rectangular cross section, as now recited in the claimed invention. Additionally, the shape of the electron beams shown in FIGs. 1 and 2 have widths that vary with the distance or height away from the electron beam generators. In FIG. 1, the electron beams generated are narrower at the top and bottom, and in FIG. 2, the electron beams appear generally cone shaped and began to narrow at the center of the irradiation Chamber 2. For electron beams as shaped in FIG. 2, there would be portions of the cross sectional area of the duct absent of electron beam coverage at least at the corners and possibly at the mid point of the left and right side edges, even if the duct were to have a rectangular cross section. It would appear that having nonirradiated portions of the cross section in Namba is not an issue since Namba relies on using nonirradiation zones 4 adjacent to irradiation zones 3 for improving the efficiency of nitrogen oxide removal.

Helfrich discloses in FIG. 1 an electron beam gas scrubbing apparatus 10 which irradiates flue gases with pulsed or intermittent electron beams from electron accelerators 36 and has a source for adding ammonia. Helfrich shows in FIG. 1, three electron accelerators 36

10/666,982

- 6 -

mounted on one side of the reactor sequentially in the direction of flow, but can also employ six accelerators. By having pulsed electron accelerators 36, some gas can pass by a particular accelerator 36 without being irradiated. Helfritch does not teach or suggest opposed emitters, the shape of the electron beam that is generated, or the cross sectional shape of the conduit 34 that is irradiated by the electron accelerators 36. Since Helfritch teaches pulsed or intermittent electron beams, and does not teach the cross sectional shape of the conduit or the shape of the electron beams, Helfritch cannot teach or suggest complete continuous electron beam coverage across the width and height of a rectangular duct. In addition, it appears that the cross section of conduit 34 has a round shape based on FIG. 1 and the related description. Reference numeral 38 is described as a "conduit or pipe" on column 4, line 8, and in FIG. 1, is shown to be a continuation of conduit 34. Also in FIG. 1, the broken ends of the inlet and outlet pipes of apparatus 10 which includes conduit 34, are depicted with the standard drafting designation for round pipes.

Accordingly, Claims 1-5, as amended, are not obvious in view of Namba and Helfritch, since neither reference, alone or in combination, teaches or suggests "a duct having a rectangular cross section having a width and height through which the gases flow", and "the duct being shaped and sized, and the electron beam emitters being configured, shaped and sized to generate electron beams that provide complete continuous electron beam coverage across the width and height of the cross section of the duct with generally evenly dispersed electrons," as recited in Claim 1, as amended, and similarly in Claims 3 and 4, as amended. Therefore, Claims 1-5, as amended, are in condition for allowance. Reconsideration is respectfully requested.

Hirai discloses in Fig. 1 a deodorizing apparatus 10 having a UV lamp 30 and an ozone decomposing catalyzing layer 34 for decomposing ozone.

Accordingly, Claims 24 and 25, are not obvious in view of Namba, Helfritch and Hirai, since none of the references, alone or in combination, teach or suggest "a duct having a rectangular cross section having a width and height through which a substance to be treated flows," and "the duct being shaped and sized, and the electron beam emitters being configured, shaped and sized to generate electron beams that provide complete continuous electron beam coverage across the width and height of the cross section of the duct with generally evenly dispersed electrons," as recited in base Claim 4, as amended. Therefore, Claims 24 and 25 are in condition for allowance. Reconsideration is respectfully submitted.

10/666,982

- 7 -

**CONCLUSION**

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.

By 

Darrell L. Wong

Registration No. 36,725

Telephone: (978) 341-0036

Facsimile: (978) 341-0136

Concord, MA 01742-9133

Date: August 7, 2008